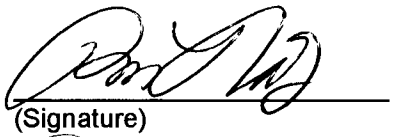
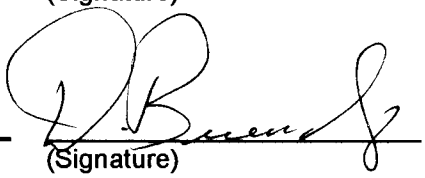
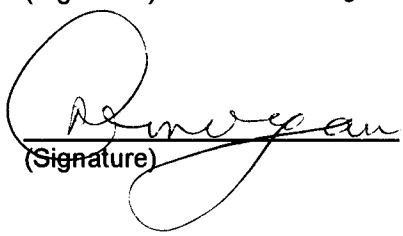
Los Alamos National Laboratory **Environmental Restoration Project** **Standard Operating Procedure**	No: LANL-ER-SOP-1.11 Rev: 0

RADIOACTIVE WASTE MANAGEMENT FOR ER PROJECT FIELD OPERATIONS

Prepared by	Pat LaFrate (Print Name)	 (Signature)	4-7-97 (Date)
Quality Review by	D. Bradbury (Print Name)	 (Signature)	4/28/97 (Date)
Technical Review by	Ron MORGAN (Print Name)	 (Signature)	4/23/97 (Date)
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Radioactive Waste Management for ER Project Field Operations

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1.0 PURPOSE

The primary objective of this procedure is to ensure that all wastes from radiological control areas (RCAs) are properly segregated as radioactive and non-radioactive. Los Alamos National Laboratory and U.S. Department of Energy (DOE) policies require that control of radioactive waste be maintained. LS 105-05 outlines the requirements for management of radioactive and potentially radioactive wastes in RCAs. It allows for the segregation of radioactive and non-radioactive waste based on either acceptable knowledge (AK) or measurements and analysis. This procedure specifies how radioactive and non-radioactive wastes within RCAs must be managed for Environmental Restoration (ER) Project sites.

2.0 SCOPE

2.1 Applicability

This procedure applies to the management of all wastes originating within RCAs on ER Project field sites.

2.2 Training

All ER Project personnel responsible for waste segregation within RCAs must be trained to this procedure. This includes, but is not limited to, waste generators, waste management coordinators, radiological control technicians, and health physics technicians. Training consists of reading this procedure. The trainee may utilize the author or technical reviewer, or other subject matter expert, to answer any questions he/she has regarding the content of this procedure. Following training, a written quiz will be administered by the ER Project Training Coordinator. A copy of the quiz results will be kept in the ER Project Records Processing Facility, as well as in the Laboratory's Employee Development System (EDS).

3.0 DEFINITIONS

A. Acceptable knowledge (AK): Information that is used for waste characterization in lieu of direct waste sampling and analysis. AK includes process knowledge, previous chemical/analytical results associated with the waste, and site characterization data and information. AK also includes information on the raw materials used in a process or operation, the associated material safety data sheets, the products produced, and the associated waste produced. AK can also include the site history, the start and end dates of an operation, knowledge of the fate of the contaminants in the environment, and a

description of all previous and current activities related to a specific site, including field screening.

B. Activation: The process of inducing radioactivity by irradiation (for example, charged particle beams).

C. Appropriate release criteria (ARC): Those radiological criteria accepted by the Laboratory as appropriate and used to release equipment, material, and waste from RCAs and/or radiological areas. Appropriate release criteria are developed in accordance with or adopted from relevant laws, DOE Orders, and standards (such as 10 CFR 20, DOE Order 5400.5 [as revised], etc.), and are approved by the DOE as necessary. ARC are defined for both surface contamination and volume contamination, specific to the media and the radionuclides.

D. Non-radioactive waste: Waste that meets the appropriate release criteria for both surface and volume contamination. Non-radioactive waste can be released to an appropriate facility that is not licensed to accept radioactive material, such as a sanitary or hazardous waste landfill.

E. Radioactive waste: Solid, liquid, or containerized gaseous material that contains radionuclides regulated under the Atomic Energy Act of 1954, as amended, and is of negligible economic value, considering costs of recovery. Radioactive waste has radioactive surface contamination or radioactive volume contamination in excess of the appropriate release criteria, as defined in this document.

F. Radiological controlled area (RCA): Any area to which access is managed to protect individuals from exposure to radiation or radioactive materials. In an *RCA controlled for contamination*, a reasonable potential exists for contamination to occur at levels in excess of those specified in DOE Order 5400.5, Figure IV-1, or a reasonable potential exists for an individual to receive more than 0.1 rem committed effective dose equivalent (CEDE) during a year from intakes. In an *RCA controlled for volume contamination*, a reasonable potential exists for the presence of volume-contaminated materials that are not individually labeled. In an *RCA controlled for external radiation*, a reasonable potential exists for an individual to receive more than 0.1 rem during a year from external radiation fields. In an *RCA for DU shrapnel*, DU exists as a result of explosive testing.

G. Routine monitoring instructions (RMIs): A formal set of instructions which outlines the routine support provided by ESH-1 to various LANL facilities, including what radiological surveys are routinely performed and on what frequency.

H. Segregate: To separate wastes into radioactive and non-radioactive waste streams.

I. Surface contamination: Radioactive contamination present on the surface of equipment in excess of the appropriate release criteria.

J. Volume contamination: Radioactive contamination dispersed throughout a matrix in excess of the appropriate release criteria. Examples of volume contamination are contaminated liquids and soils, materials activated by irradiation (for example, beams of charged particles), and smelted metals (where the smelting process incorporates radioactive material into the matrix of the metal).

K. Waste generator: Any individual and his or her line management having direct responsibility for operations that generate waste (for example, a research scientist or project manager). A waste generator may be a member of the organization responsible for the facility or site where the waste was generated. Waste generators have responsibility for the characterization, storage, and disposal of the waste they generate.

L. Waste management coordinator: The individual responsible for coordinating waste management activities on behalf of waste generators, line managers, facility managers, the waste management groups, and other Laboratory organizations. This individual also coordinates resolution of waste management issues on behalf of his or her waste generating organization, and reviews documents pertaining to the management of waste.

4.0 BACKGROUND AND/OR CAUTIONS

This procedure addresses only ER Project field operations. These projects are located throughout the Laboratory, typically involve radioactive and hazardous wastes, and are of a finite duration. Due to the often incomplete nature of AK at ER sites, projects generally release waste using direct survey and sampling methods instead of relying on acceptable knowledge.

Failure to follow this procedure could result in:

- loss of control of radioactive waste, causing unnecessary exposure or contamination of employees, members of the public, and the environment; and
- shutdown of mission-related operations on the project.

Only individuals who have received documented training on this procedure may segregate radioactive from non-radioactive waste.

Persons using this procedure to segregate waste using AK must be sufficiently familiar with the historical and current activities in the area, with the history of the item, and the policies and procedures in place for managing waste, to provide a high degree of confidence that the objective of this procedure will not be violated.

This procedure does not apply to waste generated within any posted contamination or high contamination area. Items and equipment that have been released in accordance with LP107-04, "Releasing Materials and Equipment" and meet the specified release criteria for surface contamination in Table 1 of DOE Order 5400.5 (Attachment 1) may be disposed of as non-radioactive waste.

5.0 EQUIPMENT

N/A

6.0 PROCEDURE

All radiological surveys and sample analysis performed under this procedure must be performed by trained and authorized personnel, and must be performed in accordance with LM 107-02, Radiation Protection Program Documents, including the requirements of ESH-1-01-11 ESH-1 Quality Assurance Program Plan, LP107-04, Releasing Materials and Equipment, and the ER Project Quality Program Plan. An ESH-1 Radiological Surveillance Authorization Agreement (RSAA), in accordance with ESH-1-01-03, shall be complied with when radiation protection activities which are normally performed by ESH-1 are performed by other organizations/individuals.

6.1 Responsibilities

Responsible Individual	Responsibility
Waste Generator	Follow this procedure. Ensure that personnel under your supervision comply with this procedure.
Field Project Leader	Ensure that personnel removing wastes from RCAs are appropriately trained. Assign an individual to establish and maintain an AK file for each activity which releases waste based on AK on ER Project sites. Provide oversight for the proper implementation and use of this procedure.
Waste Management Coordinator	Facilitate and coordinate waste management activities within the project. Review nonconformances resulting from waste generating operations within the RCA, and initiate corrective actions. Suspend waste generation operations in an RCA, when necessary to meet the objectives of this procedure.
Radiological Control Technicians (RCTs) Health Protection Technicians (HPTs)	Perform surveys in accordance with LANL and ESH-1 requirements, this procedure, the RMIs (when applicable), and as requested. Assist in the removal of wastes from RCAs, in accordance with LS 105-05 and LP 107-04. Inform project personnel and the waste management coordinator of unusual survey results in accordance with this procedure.

6.2 AK Criteria

There are two criteria that must be met to allow the use of AK:

AK Criterion 1 -- Site radiological conditions are within boundary conditions.
AK Criterion 2 -- Sufficient knowledge of the history and use of the waste items.

6.2.1 Site Radiological Conditions (AK Criterion 1)

6.2.1.1 Description/Justification

Historically, removable contamination levels in the majority of RCAs at ER Project sites have remained extremely low. Voluminous documentation exists that demonstrates that removable contamination levels are below minimum detectable limits and/or well below the values specified in Table 1 of DOE Order 5400.5. Using current radiological survey information, in conjunction with appropriate history/use knowledge of the waste item (criterion 2), it is reasonable to generate non-radioactive waste within the RCA boundary.

6.2.1.2 Boundary Conditions for Use of AK

The following conditions void the use of AK until such time as radiological surveys indicate that the area is free of removable contamination and that the objective of this procedure can be assured:

- airborne radioactivity releases and
- surface contamination surveys in any location within the RCA which indicate removable contamination levels in excess of release limits (i.e., Table 1) and any ongoing operations in which the control of radioactivity can not be assured.

6.2.1.3 Documentation of Site Radiological Conditions

Radiological monitoring, Quality Assurance, and documentation requirements are specified in section 6.4.

6.2.2 History and Use of the Waste Items (AK Criterion 2)

In addition to knowledge of site radiological conditions, the following criteria shall be used to determine if an item can be

disposed of as non-radioactive. An item may be treated as free of contamination and removed from the RCA if all the following conditions are met:

- no spills or releases have taken place since the most recent radiological survey
- the item has not been in direct contact with radioactive material
- the item's use and location indicate that is not likely to be contaminated
- the item is not tagged as potentially contaminated
- the item was not connected to a contaminated system
- there are no other likely reasons that the item may be contaminated; and
- the individual disposing the item has enough knowledge of the use and history of the item to accurately make a determination that all of the previous requirements have been met.

6.3 Waste Minimization

ER Project field operations minimize wastes to the extent possible, in accordance with LANL-ER-SOP-01.06, Management of Environmental Restoration Project Wastes. Non-contaminated (i.e., "green") waste shall be removed from RCAs in accordance with LP 107-04.

6.4 Activity-Specific Waste Management

The waste generated in ER Project sites consists of environmental media, personal protective equipment, contaminated tools, and miscellaneous items. Liquid wastes (including decontamination rinsate water) may be generated. All suspect waste is sampled or surveyed for radioactivity and disposed of via appropriate methods.

6.5 Quality Assurance

6.5.1 Program Requirements

Radiological surveys and analysis must be performed in accordance with LANL, ESH-1 and ER Project Radiation Protection Program and QA requirements as appropriate. Specific documents required for the execution of this procedure include, but are not limited to, the following:

- Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07;
- ESH-1 Quality Assurance Program Plan, ESH-1-01-11;

- Releasing Materials and Equipment, LP107-04;
- Surveying for Alpha and/or Beta/Gamma Contamination, ESH-1-01-02;
- Performing Large Area Swipe Surveys, ESH-1-02-05;
- Operational Checks of Direct Reading Beta/Gamma Survey Instrumentation, ESH-1-07-85;
- Operational Checks of Direct Reading Alpha Survey Instrumentation, ESH-1-07-86;
- Operational Checks of Direct Reading Tritium Survey Instrumentation, ESH-1-07-88; and
- LANL ER Quality Program Plan.

6.5.2 Training Requirements

Only individuals who have received documented training on this procedure may segregate radioactive from non-radioactive waste, as specified in Section 2.2 of this procedure.

ESH-1 RCTs/HPTs shall receive documented on-the-job training on applicable procedures and standards prior to performing surveys for the purpose of characterizing workplace radiological conditions. Non-ESH-1 personnel performing these activities shall be authorized under a Radiological Surveillance Authorization Agreement (RSAA).

6.5.3 AK Documentation

All records generated as a result of this procedure shall be submitted to the ER Project Records Processing Facility. AK documentation shall include, but not limited to, the following documents.

6.5.3.1 Radiological Survey Records

Radiological survey records must be maintained on file by the ER Project site Field Team Leader at specific LANL ER Project sites in accordance with Management of Radiological Records, ESH-1-01-12. Examples of radiological records include routine and non-routine smear survey results, surveys and documentation associated with item and equipment release, and large area survey results.

6.5.3.2 Waste Characterization Records

- Waste Characterization Strategy Forms
- Waste Profile Forms

6.5.3.3 RCT Logbooks

Daily operational logbooks must be maintained at the specific ER Project sites by the site RCT/HPT/RSP (as applicable) in accordance with Management of Radiological Records, ESH-1-01-12.

6.5.3.4 Training Records

Training records for individuals qualified to perform this procedure must be maintained with other LANL specific ER Project records by the ER Project Records Processing Facility in accordance with LANL-ER-AP-02.1, Procedure of LANL ER Records Management.

6.5.3.5 Site-Specific Radiation Protection Documents

Site-specific radiation protection program documents, including RMIs (when applicable) and RSAAs, must be maintained on file in the ESH-1 ER/D&D Team Office (TA-59-30-113).

7.0 REFERENCES

LS 105-05, Removing Waste from Radiological Controlled Areas
LM 107-02, Radiation Protection Program Documents
LP 107.04, Releasing Materials and Equipment
ESH-1-01-02, Surveying for and/or Contamination
ESH-1-01-03, Radiological Surveillance Authorization Agreement,
ESH-1-02-05, Performing Large Area Swipe Surveys
ESH-1-01-11, ESH-1 Quality Assurance Program Plan (QAPP)
ESH-1-01-12, Management of Radiological Records
ESH-1-07-85, Operational Checks of Direct Reading Survey Instrumentation,
ESH-1-07-86, Operational Checks of Direct Reading Alpha Survey Instrumentation
ESH-1-07-88, Operational Checks of Direct Reading Tritium Survey Instrumentation
DOE Order 5400.5, 1/96, Radiation Protection of the Public and the Environment
LANL-ER-AP-02.1, Procedures for LANL ER Records Management
LANL-ER-QPP, ER Quality Program Plan
LANL-ER-SOP-10.06, Management of Environmental Restoration Project Wastes
LANL-ER-SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels

8.0 RECORDS

Training Course Information/Roster
RSAAs
Radiological Survey Records
RCT Logbooks
Waste Characterization Strategy Forms
Waste Profile Forms
Quiz Results

9.0 ATTACHMENTS

Attachment A - DOE Order 5400.5, Table 1

Table 1. Surface Activity Guidelines

Allowable Total Residual Surface Activity (dpm/100cm^2)[4]

Radionuclides[5]	Average[6/7]	Maximum[7/8]	Removable[9/9]
Group 1 - Transuranics, I-125, I-129, Ac-227, Ra-226, Ra-228, Th-228, Th-230, Pa-231	100	300	20
Group 2 - Th-natural, Sr-90, I-131, I-133, Ra-223, Ra-224, U-232, Th-232	1000	3000	200
Group 3 - U-natural, U-235, U-238, and associated decay products, alpha emitters	5000	15000	1000
Group 4 - Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous[10] fission) except Sr-90 and others noted above	5000	15000	1000
Tritium (applicable to surface and subsurface)[11]	N/A	N/A	10000

[4] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive materials as determined by counts per minute measured by an appropriate detector for background efficiency, and geometric factors associated with the instrumentation.

[5] Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[6] Measurements of average contamination should not be averaged over an area of more than 1 m2. For objects of smaller surface area, the average should be derived for each such object.

[7] The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

[8] The maximum contamination level applies to an area of not more than 100 cm^2.

[9] The amount of removable material per 100 cm^2 of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

[10] This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

[11] Property recently exposed or decontaminated should have measurements (smears) at regular time intervals to ensure that there is not a build-up of contamination over time. Because tritium typically penetrates material it contacts the surface guidelines in group 4 are not applicable to tritium. The Department has reviewed the analysis conducted by the DOE Tritium Surface Contamination Limits Committee ("Recommended Tritium Surface Contamination Release Guides," February 1991), and has assessed potential doses associated with the release of property containing residual tritium. The Department recommends the use of the stated guideline as an interim value for removable tritium. Measurements demonstrating compliance of the removable fraction of tritium on surfaces with this guideline are acceptable to ensure that non-removable fractions and residual tritium in mass will not cause exposures that exceed DOE dose limits and constraints.